



STATE OF DELAWARE  
DEPARTMENT OF NATURAL RESOURCES &  
ENVIRONMENTAL CONTROL  
**DIVISION OF WATER RESOURCES**  
89 KINGS HIGHWAY  
DOVER, DELAWARE 19901

## **FACT SHEET**

Delaware City Refining Company LLC  
4550 Wrangle Hill Road  
Delaware City, Delaware 19706

NPDES Permit DE0000256  
State Permit No. WPCC 3256D/74

The Delaware City Refining Company LLC has applied for reissuance of its National Pollutant Discharge Elimination System (NPDES) permit to discharge cooling water, treated process wastewater, and storm water from its Delaware City Refinery and Power Plant to the Delaware River at river mile 60.

The Premcor Refining Group Inc., a subsidiary of Valero Energy Corporation, transferred ownership of the Delaware City Refinery ("DCR", NPDES permit DE0000256) and Delaware City Power Plant ("DCPP", NPDES Permit No. DE0050601) to the Delaware City Refining Company LLC (DCRC) effective June 1, 2010.

NPDES permit No. DE0050601, formerly a separate permit for the Delaware City Power Plant, is subsumed into this permit, NPDES permit No. DE0000256 (State Permit No. WPCC 3256D/74).

## **Summary of Proposed Changes**

The following summarizes permit changes.

1. Combine the Delaware City Power Plant NPDES permit (No. DE0050601) into the DCR NPDES permit (No. DE0000256).
2. Change several requirements for Outfall 001.
  - a. Add flow limit of 303 mgd, measured as a 12 month rolling average.
  - b. Add yearly PCB congener monitoring.
  - c. Add quarterly chronic biomonitoring.
  - d. Delete acute biomonitoring.
  - e. Change Oil & Grease limits to performance-based limits of 7 and 10 mg/L average and maximum limits, respectively.
3. Add iron limits for Outfall 011.
4. Consolidate DCPP Outfall 013 requirements into DCR Outfall 401<sup>1</sup>. Comparison of intake and 013 Outfall monitoring shows that neither limits nor further monitoring are warranted for Total Suspended Solids, hardness, Lead, and Zinc. Added aluminum monitoring.

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<sup>1</sup> Under the formerly separated NPDES permits, Outfall 013 monitored where discharge exited the De. City Power Plant (DCPP). Outfall 401 monitored where the DCPP discharge entered the De. City Refinery, upstream of the Refinery's final Outfall to the De. River, Outfall 001.

5. Delete Iron and Zinc monitoring for Outfalls 016 & 017, and reduce monitoring frequency from quarterly to annually, except that discharge flows through these outfalls will be reported monthly.
6. Correct and update Outfall information.
  - a. Correct locations and receiving waters for Outfalls 003A and 003B.
  - b. Add Outfall 009, a monitoring location for storm water discharges from the permittee's railroad activities that existed prior to re-start of the refinery in 2010.
  - c. Delete Outfall 015. Some discharges have been eliminated, and the rest have been redirected to the wastewater treatment facility (WWTF) which discharges through Outfall 601.
  - d. Add new Outfalls 043, 044, 045, and 046 for storm water runoff from the new rail loop and rail "storage in transit" (SIT) yard.
  - e. Rename Outfall 51 to 51a, and add Outfall 51b. Outfall 51b is the new discharge point for the fish return system.
  - f. Add Outfalls 053, 054, and 055. These are existing storm water outfalls, newly identified in the permit. These discharges are storm water runoff from areas adjacent to the pipe rack running from the pier to the refinery facility.
  - g. Renumber Outfall 801. Non-storm water discharge (from surge tank overflow) eliminated. Outfall renumbered to "008" as a "storm water-only" outfall.
  - h. Change discharge descriptions, process diagrams, limits, and monitoring as appropriate regarding the new (since the last permit re-issuance) Wet Gas Scrubbers.
7. Add new Special condition No. 3 requiring the submission of new NPDES application forms for all Outfalls. The permittee did submit updated applications in December 2010,<sup>2</sup> but the water samples dated as far back as 2002. Samples for these Application Forms must be less than three years old.
8. Add new Special Condition requiring use of "Sufficiently Sensitive Test Methods".
9. Prohibit use of caustic produced by the mercury cell chlor-alkali process.
10. Add Schedule of Compliance to effectuate interim "Best Technology Available" (BTA) for Cooling Water Intake Structures (CWIS) in accordance with the August, 2014 316(b) Rule.
11. Continue to implement the Delaware Estuary PCB Total Maximum Daily Load (TMDL) through a Special Condition that adds narrative water quality-based effluent limits (WQBELs) for PCBs in the form of a Pollutant Minimization Plan (PMP) to reduce discharges of PCBs to the maximum extent practicable and PCB monitoring requirements.
12. Require monitoring for congeners of PCBs, dioxins, and furans
  - a. New Special Condition No. 11 requires monitoring for congeners of PCBs, and a Pollutant Minimization Plan (PMP) for PCBs. DCR is already doing this, per DRBC requirements. This change just codifies that as a NPDES permit requirement.
  - b. Concomitant with the addition of Special Condition No. 11, Special Condition No. 2 of the old permit for the Delaware City Power Plant (DCPP) has been deleted.
13. Delete dry weather requirements for Outfall 036. DCR has eliminated dry weather flows. Moved 036 to same page as "storm water only" outfalls.
14. New Special Condition No. 7 specifies requirements for "proper operation and maintenance" of the No. 2 API Separator, and of Guard Basins 5 and 6.
15. Increase flow limit for Outfall 501 from 3 mgd to 9 mgd. Outfall 501 is backwash from the intake screens. The proposed screens will use higher backwash flows that are intended to return, more gently, undamaged any aquatic life from the screens to the source water body.
16. Change several requirements for Outfalls 101 and 601. Discharge from Outfall 601, storm water from refining areas, and storm water from adjacent remediation areas in the past all went into Guard Basin

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<sup>2</sup> The samples were not taken in 2010 because the facility was not operating and the samples would not have been representative.

4. The outlet of Guard Basin 4 is Outfall 101. Guard Basin 4 is currently out of service. Outfall 601 and refining area storm water have been redirected into Guard Basins 5 and 6.
  - a. Add permit language per Guard Basin 4 being out of service, but provide that it may be returned to service.
  - b. Moved sampling requirement for sulfides upstream of the wastewater treatment facility from the Outfall 601 limits page to a new Special Condition.
  - c. Add Iron and Selenium limits for Outfall 601. The permit provides a five year compliance schedule for selenium.
17. Increase flow allowance for Outfall 701, which recycles water from the cooling water discharge canal to the main intake channel.
18. Delete old DCR permit Special Condition No. 2. It defined compliance for “non-detect” limits for Total Residual Chlorine (TRC) for Outfall 701. Rather than require monitoring for TRC at Outfall 701, the permit prohibits addition of TRC at Outfall 701.
19. Changed wording of Special Condition, “Sampling and Reporting for ‘Multiple Grabs’ Sample Types”, to more clearly define requirements for those types of samples.
20. Add requirement to “Storm Water Plan” Special Condition that storm water discharges to Red Lion Creek and Dragon Run Creek must comply with respective TMDL’s for nitrogen, phosphorus and enterococcus.

## **Information**

The following is general information about the site and its discharges to surface waters of the State.

### ***Facility Location***

The facility is located at Route 9 and Wrangle Hill Road in Delaware City.

### ***Activity Description***

The permittee operates the Delaware City Refinery (DCR), the Delaware City Power Plant (DCPP), and oil terminal (truck and ship) facilities at this location. The refinery is designed to process heavy, high sulfur crude oils. Refinery products include heptenes - nonenes, sulfur, LPG (propane), gasoline, benzene, toluene, jet fuel, kerosene, diesel fuel, coke, and No. 2 fuel oil. The DCPP generates steam and electricity for use primarily at the Refinery. The DCPP consists of four gas-fired utility boilers and two gas-fired combined cycle turbines with a combined net generating capacity of approximately 295 MW(e). The plant’s discharge consists principally of once-through non-contact cooling water.

### ***Discharge Description***

Thirty-four (34) Outfalls are identified in the permit. Most of those outfalls are pre-existing, although storm water flows from the Refinery to Outfall 101 and Wastewater Treatment Facility discharge flows to Outfall 601 have been re-routed to Outfall 201. Ten (10) Outfalls were formerly included in the Delaware City Power Plant permit. Pages 2 and 3 of the permit lists the constituents of these outfalls. The following table summarizes general types of discharge constituents.

## Summary of Discharges Constituents

Table 1 – Summary of Discharges Constituents					
Outfall	Discharges To	Flow Limit (mgd)	Discharge Components		
			Process	Noncontact Cooling Water	Storm water
001	De. River	452	Yes	Yes	Yes
002	De. River	--	--	--	Yes
003a	001	--	--	--	Yes
003b	Cedar Creek	--	--	--	Yes
004	Cedar Creek	--	--	--	Yes
005	Dragon Run Creek	--	--	--	Yes
006	Red Lion Creek	--	--	--	Yes
007	Dragon Run	--	--	--	Yes
008 <sup>3</sup>	Cedar Creek	--	--	--	Yes
009	401	--	--	--	Yes
011	401	0.675	Yes	--	--
016*	401	--	Yes	--	Yes
017*	401	--	Yes	--	Yes
031*	001	--	--	--	Yes
032*	401	--	--	--	Yes
033*	401	--	--	--	Yes
034*	036	--	--	--	Yes
035*	401	--	Yes	--	--
036*	001, via settling ponds	--	--	--	Yes
043	Red Lion Creek	--	--	--	Yes
044	Red Lion Creek	--	--	--	Yes
045	Red Lion Creek	--	--	--	Yes
046	Red Lion Creek	--	--	--	Yes
051	Dragon Run Creek	--	--	--	Yes
052	Dragon Run Creek	--	--	--	Yes
053	Dragon Run Creek	--	--	--	Yes
101**	001	--	Yes	--	Yes
201	001	398	--	Yes	Yes
301	001	--	Yes	Yes	Some
401	001	--	--	Yes	Some
501a	Cedar Creek	9	--	Yes	--
501b	Dragon Run Creek	9	--	Yes	--
601	201	13	Yes	--	Yes
701 <sup>4</sup>	Cedar Creek	--	--	Yes	Yes
801	Renumbered to "008". <sup>3</sup>				

\* Indicates Outfalls that were formerly included in the Delaware City Power Plant Permit No. DE0050601.  
\*\* See Item No. 16 under "Summary of Proposed Changes" above.

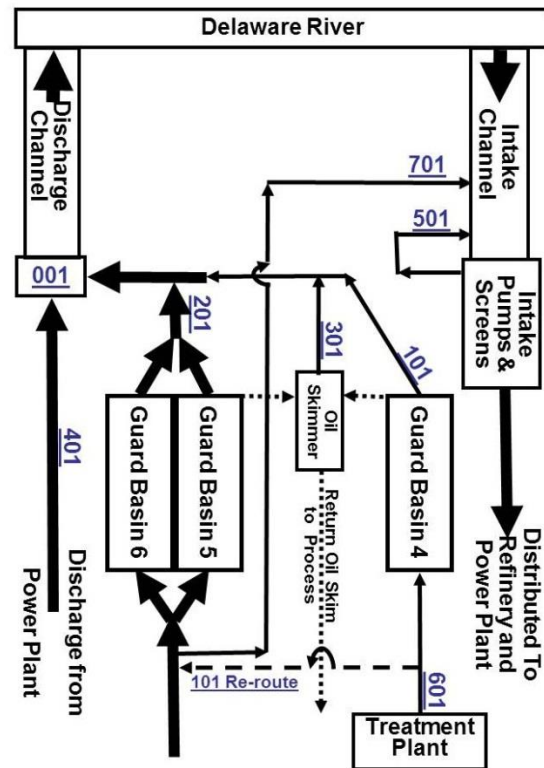


Figure 1 -- Outfall Connections

## Statutory and Regulatory Basis

The Delaware Department of Natural Resources and Environmental Control (DNREC) proposes to reissue an NPDES permit to discharge the wastewater, storm water, and non-contact cooling water subject to certain effluent discharge limitations, monitoring requirements and other terms and conditions identified in the draft permit. Section 402 of the federal Clean Water Act, as amended, and 7 Del. C. Chapter 60 provide the authority for permit issuance. Federal and State regulations promulgated pursuant to these statutes are the regulatory bases for permit issuance.

<sup>3</sup> The permittee has eliminated non-storm water discharges from Outfall 801, and the permit now identifies this Outfall as "008", consistent with numbering for other site storm water outfalls.

<sup>4</sup> At valve allowed open 100%, estimated flow is approx 33 MGD.

## Receiving Stream Classification

Regulatory agencies classify water bodies according to their designated uses (e.g. aquatic life protection, fishing, swimming, etc.). Agencies assess whether or not each water body supports (“attains”) each of its designated uses, and report their assessments in “305(b)” Reports<sup>5</sup>. When a stream is in nonattainment of a designated use, it must be listed on a “303(d) List”, which shows the causes of the impairment, and a schedule for agencies to address those impairments, usually via the TMDL<sup>6</sup> process. As part of a TMDL, the regulating agency would allocate allowable pollutant discharge amounts (if assimilative capacity is available) among industrial and municipal point source dischargers.

A water body impairment may well not be associated with the nearest NPDES permittee, but with one or many other sources or problems in the watershed. NPDES permittees do receive extra scrutiny regarding known impairments in the receiving water body, to check if the discharges are causing or contributing to the impairments.

Most of the Refinery’s discharges go directly to the Delaware River, via their Outfall 001. Some storm water outfalls discharge indirectly to the Delaware River via Dragon Run and Red Lion Creek. Five outfalls discharge into the intake channel, also known as Cedar Creek. For the main stem of the Delaware River, the Delaware River Basin Commission (DRBC) assesses how well the water body meets its designated uses: aquatic life protection, fish consumption, shellfishing, and swimming. Similarly, for Dragon Run, Red Lion Creek and Cedar Creek, DNREC assesses designated uses: aquatic life protection, primary contact recreation, secondary contact recreation, and Industrial Water Supply. Fresh water segments of Dragon Run and Red Lion Creek also have two additional designated uses: public water supply and agricultural water supply.

The DNREC 305(b) Report does not list assessment results separately for Cedar Creek, since the Department has not monitored in Cedar Creek. The net advective flow in that Creek consists of water drawn into the Refinery by its intake pumps, so the Department takes the quality, uses, and attainment status for Cedar Creek to be the same as for the Delaware River main stem.

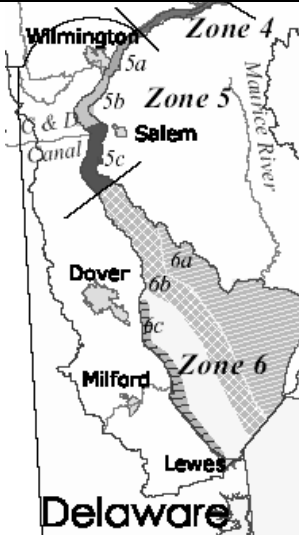
For the Delaware River, the 2012 DRBC 305(b) Report shows “Not supported” for two designated uses: Aquatic Life and Fish Consumption; see the Table below.

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<sup>5</sup> Called “305(b) Reports” because they are required under Section 305(b) of the Federal Clean Water Act.

<sup>6</sup> “TMDL” is the “Total Maximum Daily Load” from point, nonpoint, and natural background sources that a water body can assimilate and still support designated uses.

Table 2. Extent of Use Support for the Delaware River, Zone 5 <sup>7</sup>	
Designated Use	Use Support Level
Aquatic Life	Not Supported
Recreation	Supported
Drinking Water	NA
Fish Consumption	Not Supported
Notes: NA: Ambient criteria not applied in these zones "Zone 5" extends from Delaware River Mile 48.2 to 78.8. River Mile 0.0 is at Cape Henlopen point, at the Delaware River mouth.	



The map illustrates the Delaware River and its assessment units. Zone 4 is located at the top right. Zone 5, which is the focus of the table, is a dark, shaded area in the upper left, subdivided into 5a, 5b, and 5c. Zone 6 is a large, light-gray shaded area in the center and lower right, subdivided into 6a, 6b, and 6c. Key locations marked include Wilmington, Salem, Dover, Milford, and Lewes. The C & D Canal is also shown. The word 'Delaware' is written at the bottom of the map.

Figure 2 -- De. River Assessment Units

Figure 2 -- De. River Assessment Units

Table 3. Fish Consumption Advisories in the Vicinity of the DCR, as of June 22, 2018 <sup>8</sup>				
Waterbody	Species	Contaminant of Concern*	Geographical Extent	MEALS/YR (8-OUNCE SERVING)
All Waters Not Listed Below <sup>9</sup>	All species not listed below	All	All Areas not Listed	52
Delaware River	All Finfish	PCBs, Dioxins and Furans, Dieldrin	Delaware State Line to the C&D Canal	3*
Lower Delaware River and Delaware Bay	White Perch	PCBs	Chesapeake & Delaware Canal to the Mouth of the De. Bay	6
	Blue Fish 20 inches or less	PCBs	Chesapeake & Delaware Canal to the Mouth of the Delaware Bay	12
	Bluefish-greater than 20 inches	PCBs, Mercury	Chesapeake & Delaware Canal to the Mouth of the Delaware Bay	3*
	Striped Bass, White Catfish, Channel Catfish, American Eel	PCBs	Chesapeake & Delaware Canal to the Mouth of the Delaware Bay	3*
Red Lion Creek	All Finfish	PCBs, Dioxins and Furans	Route 1 to the Delaware River	2
		PCBs, Dieldrin	Upstream of Route 1	12

\* Women of childbearing age and children should not consume any amount of these fish.

<sup>7</sup> "Delaware River Basin Commission 2012 Delaware River and Bay Water Quality Assessment", "Table 24: Summary of the 2012 Assessment", pg. 45, <http://www.state.nj.us/drbc/library/documents/WQAssessmentReport2012.pdf>,

<sup>8</sup> <http://www.fw.delaware.gov/Fisheries/Pages/Advisories.aspx>

<sup>9</sup> In the DCR's case, this would apply to Dragon Run Creek.

SEGMENT	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Pollutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology
Delaware River, Zone 5	From the Pennsylvania-Delaware line to Liston Point, Delaware.	59.0 sq. mi.	Bacteria	PS, NPS	1996	2005		1	
			PCBs	PS, NPS, SF	1996	2005	2003	4a	2006
			Arsenic		2002			1	2006
			Dioxin		2002	2017		5	
			Mercury		2002	2016		5	
			Chlorinated Pesticides		2002	2017		5	
			Chronic Toxicity (DRBC Zones 5a and 5b, 25 sq miles)	PS, NPS, SF	2002			1	
			Iron		2004			3	
Delaware River, Zone 5c	Lower portion of DRBC Zone 5	31 sq. mi.	Dissolved Oxygen	PS, NPS	2006	2019		5	
Lower Red Lion Creek	From U.S. Route 13 to the mouth at Delaware River	1.5 miles	Dissolved Oxygen	NPS	1996	2006	2006	4a	2008
			Nutrients	NPS	1996	2006	2006	4a	2008
			Chlorinated Benzenes		1996			1	2002
			Bacteria	NPS	2002	2006	2006	4a	2008
			PCBs	NPS	2002	2011		5	
			Dioxins	NPS	2002	2011		5	
			Chronic Toxicity	NPS, PS	2012	2025		5	
Lower Dragon Run	From dam at the water supply pond to the mouth of Delaware River	3.2 miles	Nutrients	NPS	1998	2006	2006	1	2008
			Dissolved Oxygen	NPS	1998	2006	2006	4a	2008
			Bacteria	NPS	2002		2006	1	2008
<b>KEY for CALM Code<sup>11</sup></b>						<b>KEY for Probable Source(s):</b>			
1 = Fully Supporting for this parameter						NPS = Nonpoint Source(s)			
3 = Information is insufficient to make a determination						PS = Point Source(s)			
4a = TMDL has been completed and approved by EPA						SF = Superfund Site(s)			
4b = Management Actions are expected to solve impairment									
5 = TMDL Needed									

## Bases for Permit Requirements

DNREC has examined the application, recent discharge monitoring data, and related information. The Department proposes to reissue the facility's NPDES permit for a period not to exceed five (5) years, subject to the effluent discharge limitations and monitoring requirements shown in the attached permit.

## Impingement and Entrainment

The permittee's facility includes a cooling water intake structure governed by Section 316(b) of the Clean Water Act, "CWA 316(b)," which requires that the location, design, construction and capacity of the cooling water intake structures reflect the "best technology available for minimizing adverse environmental impact" (BTA). Rulemaking for CWA 316(b) occurred in three phases: Phase I for new facilities (completed in 2001), Phase II for existing electric generating plants (2004), and Phase III (2006) for existing manufacturing facilities. Phase II and Phase III were remanded to EPA for reconsideration as

<sup>10</sup> See <http://www.dnrec.delaware.gov/swc/wa/Pages/WatershedAssessment305band303dReports.aspx>

<sup>11</sup> See <http://www.dnrec.delaware.gov/swc/wa/Pages/WatershedAssessment305band303dReports.aspx>, Page 119

a result of legal proceedings. The August 15, 2014 Final CWA 316(b) Rule combined these remands into one rule.<sup>12</sup>

The final August 15, 2014 316(b) Rule (see discussion above) establishes the following requirements:

1. Existing facilities that withdraw at least 25% of their water from an adjacent waterbody exclusively for cooling purposes and have a design intake flow of greater than 2 million gallons per day (MGD) are required to reduce fish impingement. The Rule further states that the permittee will need to select one of seven options for meeting best technology available (BTA) requirements for reducing impingement.
2. Additionally, existing facilities that withdraw at least 125 million gallons per day are required to conduct studies to provide information to their permitting authority to allow for the determination of entrainment BTA (i.e. the best technology available to reduce the number of aquatic organisms entrained by cooling water systems).

Through a Supplemental Application submitted by the permittee subsequent to the promulgation of the final 316(b) Rule, the permittee has selected modified traveling screens in accordance with §125.94 of the final 316(b) Rule as their compliance option for meeting BTA requirements for reducing impingement. Modified traveling screens cannot be established as final BTA for impingement until

1. The technology is installed,
2. Two years of impingement technology performance optimization studies (40 CFR 122.21 (r)(6)(i)) are performed, and
3. Upon review of the study results DNREC determines that modified traveling screens are BTA for impingement at this site.

In accordance with the final 316(b) Rule, selection of BTA for impingement is allowed to occur subsequent to the entrainment BTA determination. This is because in some instances entrainment controls can also address impingement while impingement controls typically may not address entrainment. Postponing impingement BTA until after entrainment BTA is established is allowed, in case entrainment BTA would have been sufficient for both entrainment and impingement. However, the Delaware City Refining Company LLC ("the permittee") and the Department entered into a Settlement Agreement on December 4, 2014, to clarify the process for renewal of the Discharge Permits and the Refinery's compliance with the 316(b) Rule (as promulgated on August 15, 2014), to resolve DNREC's claims of noncompliance, and to gain environmental benefit from early implementation of interim impingement BTA technology. As such, the permittee proposed a schedule for installation of Modified Travelling Screens and a Fish Return System during this permit cycle while entrainment studies are still ongoing. Both of these systems have been installed prior to the permits issuance.

In addition, interim entrainment requirements are established in this permit which include submission of all applicable studies as required in 40 CFR 122.21(r) "the entrainment studies", implementation of the modified traveling screens and fish return system, a project to recycle effluent from the Refinery's wastewater treatment plant into the cooling water system (the "Effluent Recycle Project"), and the reduction of water intake at the intake structure from higher historic rates to 303 million gallons per day ("MGD"), calculated on a twelve (12) month rolling average. Since prior entrainment study data for this facility is over ten years old, the permittee has opted to re-initiate all studies in accordance with the 316(b) Rule rather than petition the Department to utilize studies conducted at the facility in the past. A compliance schedule has been established to require annual reports of progress towards completion of studies required in 40 CFR 122.21(r). Final submission of all 40 CFR 122.21(r) studies is required no later than six months prior to the permit expiration date.

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<sup>12</sup> On August 15, 2014, EPA published in the Federal Register of Regulations its final rule entitled "National Pollutant Discharge Elimination System—Final Regulations To Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities; Final Rule".



Per 40 CFR §125.98(f), the Department must establish *final* site-specific BTA entrainment requirements after reviewing the information submitted under 40 CFR 122.21(r) and §125.95. As proposed, the information submittal will not be complete until 4½ years after the permit effective date, so the Department's final BTA Determination for entrainment would be in the next reissuance of this NPDES permit.

Per requirements of 40 CFR §125.94(g),

The Department may establish in the permit additional control measures, monitoring requirements, and reporting requirements that are designed to minimize incidental take, reduce or remove more than minor detrimental effects to Federally-listed species and designated critical habitat, or avoid jeopardizing Federally-listed species or destroying or adversely modifying designated critical habitat (e.g., prey base). Such control measures, monitoring requirements, and reporting requirements **may include measures or requirements identified** by an appropriate Field Office of the U.S. Fish and Wildlife Service and/or Regional Office of the National Marine Fisheries Service **during the 60 day review period** pursuant to §125.98(h) **or the public notice and comment period** pursuant to 40 CFR 124.10. Where established in the permit by the Department, the owner or operator must implement any such requirements.

The Schedule of Compliance does add some details regarding requirements, to ensure that the Department will have all the information under 40 CFR 122.21(r) necessary to establish impingement mortality and entrainment BTA standards under §125.94(c) and (d) for the subsequent permit. Regulatory bases for these additional requirements are as follows:

Subpart J--Requirements Applicable to Cooling Water Intake Structures for Existing Facilities  
Under Section 316(b) of the Clean Water Act

**§125.90 Purpose of this subpart.**

- (c) Nothing in this subpart shall be construed to preclude or deny the right under section 510 of the CWA of any State or political subdivision of a State or any interstate agency to adopt or enforce any requirement with respect to control or abatement of pollution that is more stringent than required by Federal law.

**§125.94(i) *More stringent standards.***

The Department must establish more stringent requirements as best technology available for minimizing adverse environmental impact if the Department determines that compliance with the applicable requirements of this section would not meet the requirements of applicable State or Tribal law, including compliance with applicable water quality standards (including designated uses, criteria, and antidegradation requirements).

**§125.98 Department requirements.**

- (b) Based on the information submitted in the permit application, the Department must determine the requirements and conditions to include in the permit.
  - (6) The Department may include permit conditions to ensure that the Department will have all the information under 40 CFR 122.21(r) necessary to establish impingement mortality and entrainment BTA requirements under §125.94(c) and (d) for the subsequent permit. The Department must establish interim BTA requirements in the permit on a site-specific basis based on the Department's best professional judgment in accordance with §125.90(b) and 40 CFR 401.14.

***Monitoring DNREC tagged fish***

To assess the Delaware River sturgeon population, the Division of Fish & Wildlife conducts gill net surveys in the lower Delaware River. Sturgeon are measured, weighed, and tagged with an external dart tag and internal PIT tag (microchip) prior to release. Since 1991, nearly 1,900 Atlantic sturgeon have been tagged, ranging in size from 20 to 70 inches. Results of fish tagging programs provide important information on Delaware River sturgeon fish population. As an Interim BTA requirement for Impingement

The Refinery shall install a monitoring station near their cooling water intake to identify these tagged fish and see what, if any, of these tagged fish are making it up into the top of their intake channel.

### ***Cooling Water Intake Channel Flow***

A high rate of speed of cooling water flow can act to trap fish in the cooling water channel and eventually impinge them on the intake screens. In a one-time test, the Refinery demonstrated that the stream flow in the Cedar Creek at low tide and maximum pumping conditions was well below one foot per second on average. The Refinery will demonstrate that the flow in Cedar Creek continues to average less than one foot per second on a regular basis through using the HEC-RAS hydraulic model, as described below.

Figure 1: Refinery Intake Overview



### **Hydraulic Model**

The refinery is proposing to use the HEC-RAS hydraulic model for the calculation of velocity at the trash rack in the intake canal. Under the direction of the United States Army Corp of Engineers (USACOE), the Hydrologic Engineering Center (HEC) in Davis, California developed the River Analysis System (RAS) to aid hydraulic engineers in channel flow analysis and floodplain determination. The USACOE utilizes this modeling program to manage the rivers, harbors, and other public works under their jurisdiction. This model has been widely accepted and used by numerous public and private firms since its introduction in 1995.

### **Intake Flow**

The Refinery continuously measures the intake flow and reports it in millions of gallons per day (MGD). The maximum flow for each reporting period (day), as calculated for the monthly Discharge Monitoring Reports (DMRs), will be converted to cubic feet per second (cfs) by multiplying the flow in MGD by a conversion factor 1.547 MGD/cfs. The flow in cfs will then be used to estimate the canal velocity at the trash rack.

### **Tidal Flow**

The area behind the trash rack (as shown in Figure 1) is influenced by both the Refinery intake flow and tidal inflow and outflow. Tidal flow will increase the velocity at the trash rack during incoming tides, and decrease the velocity on outgoing tides. The influence the tides have on velocity at the trash rack will be

determined by estimating the volume of the incoming and outgoing tides between the trash rack and the intake.

To estimate tidal flow, the Refinery will calculate the maximum expected water surface area behind the trash rack using the distance from the trash racks to the intake and the width of the trash rack. This surface area will be a fixed value and will not change over time. The change in water surface height between recording periods, assumed to be an hour, will then be multiplied by the surface area to estimate the total tidal volume entering the area between the two measurements. The flow in cfs will then be calculated by dividing the volume of water entering the area behind the trash racks by 60 minutes (3,600 seconds).

#### Cross-Sectional Area

The effective cross-sectional area at the trash rack will be estimated using the relationship between the tidal stage measured at NOAA Station: 8551762, located near the mouth of Cedar Creek and the estimated cross-sectional area used in the Cedar Creek HEC-RAS model. The HEC-RAS cross-sectional area (Figure 2) is based on the most current bathymetric survey at the trash rack. The bathymetry used to estimate the cross-sectional area can be updated as needed, when additional bathymetric data is collected. The relationship between the tidal stage and cross-sectional area for the current bathymetric profile is provided in the Figure 2. The equation shown in Figure 3 is used to account for changes in the effective cross-sectional with tidal stage.

Figure 2: Existing Bathymetry at the Trash Rack (HEC-RAS cross-section 200)

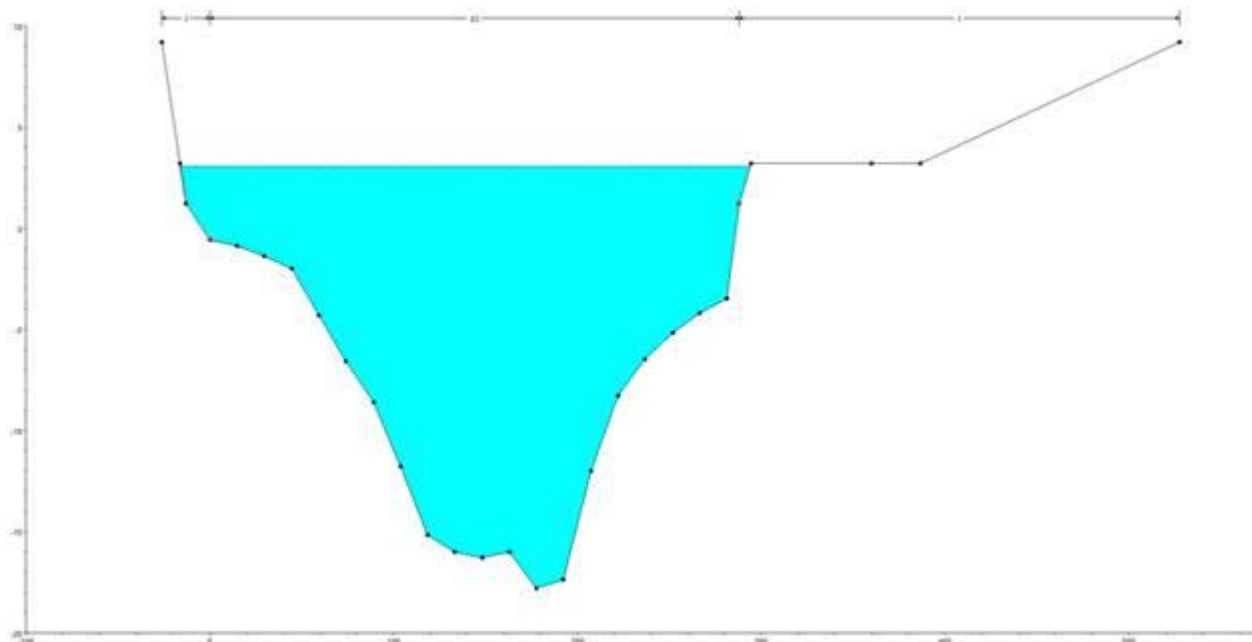
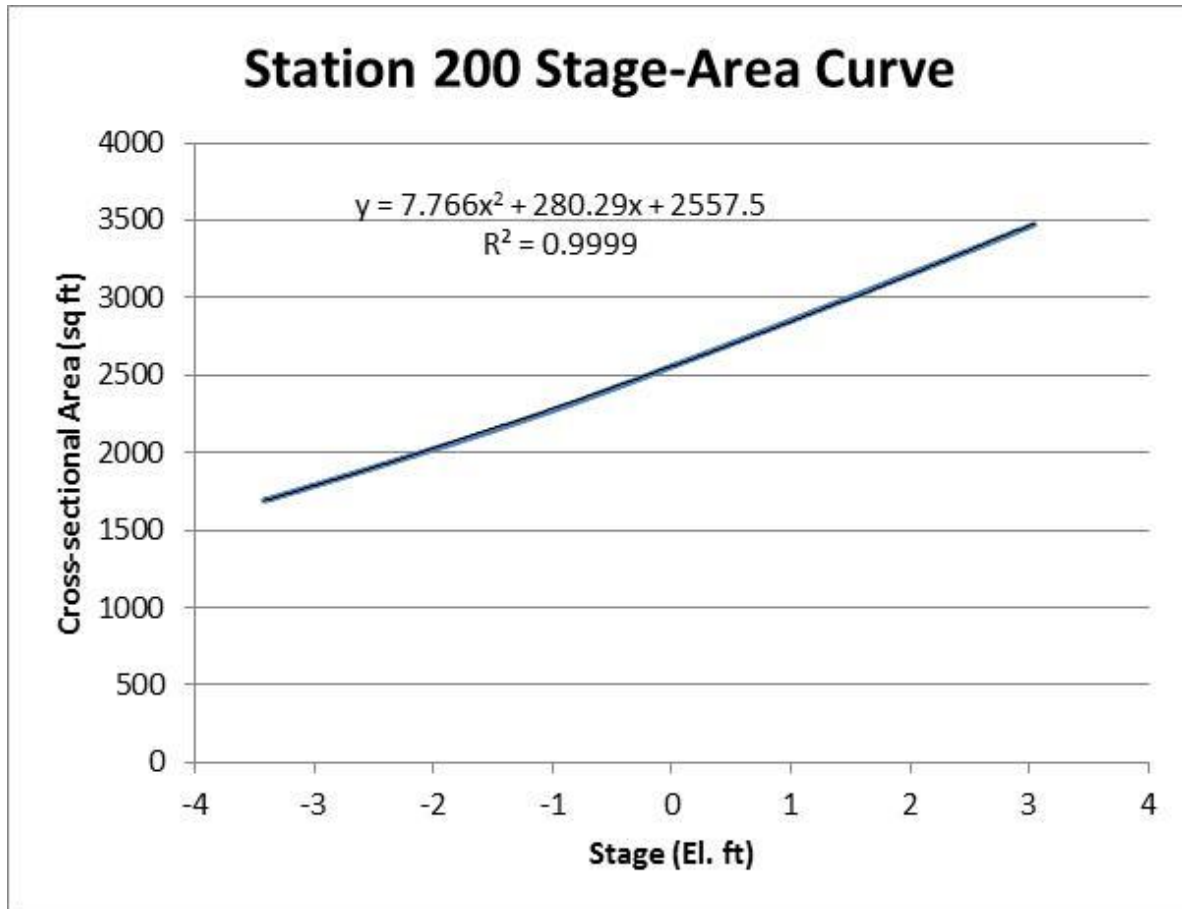


Figure 3: Stage Area Relationship



#### Velocity Estimation

With an estimate of the maximum intake withdrawal rate, the tidal flow rate, and the effective cross-sectional area at the trash rack, the water velocity at the trash rack can be estimated using the total flow through the trash rack and effective cross-sectional area. An example calculation is provided below.

*Example Velocity Calculation (this is only an example and does not represent any specific or actual day)*

#### Inputs

Refinery flow = 400 MGD  
Tidal Stage: El -2.5 ft.  
Water level change between measurements: +1.5 ft (incoming tide)  
Time between measurements = 60 minutes  
Width of Trash Rack = 330 ft  
Distance from Intake to Trash Rack = 175 ft

Sub calculations

$$\text{Intake flow} = 400 \text{ MGD} \times 1.547 \frac{\text{cfs}}{\text{MGD}} = \mathbf{618.8 \text{ cfs}}$$

$$\text{Area Behind Trash Rack} = 330 \text{ ft} \times 175 \text{ ft} = 57,750 \text{ ft}^2$$

$$\text{Tidal Volume Behind Trash Rack} = 57,750 \text{ ft}^2 \times 1.5 \text{ ft} = 86,625 \text{ ft}^3$$

$$\text{Tidal Flow Rate} = 86,625 \text{ ft}^3 \div \left( 60 \text{ min} \times 60 \frac{\text{sec}}{\text{min}} \right) = \mathbf{24.1 \text{ cfs}}$$

$$\text{Effective Cross Sectional Area} = 7.766 \times -2.5 \text{ ft}^2 + 280.29 \times -2.5 \text{ ft} + 2,557.5 = \mathbf{1,905 \text{ ft}^2}$$

Velocity Calculation

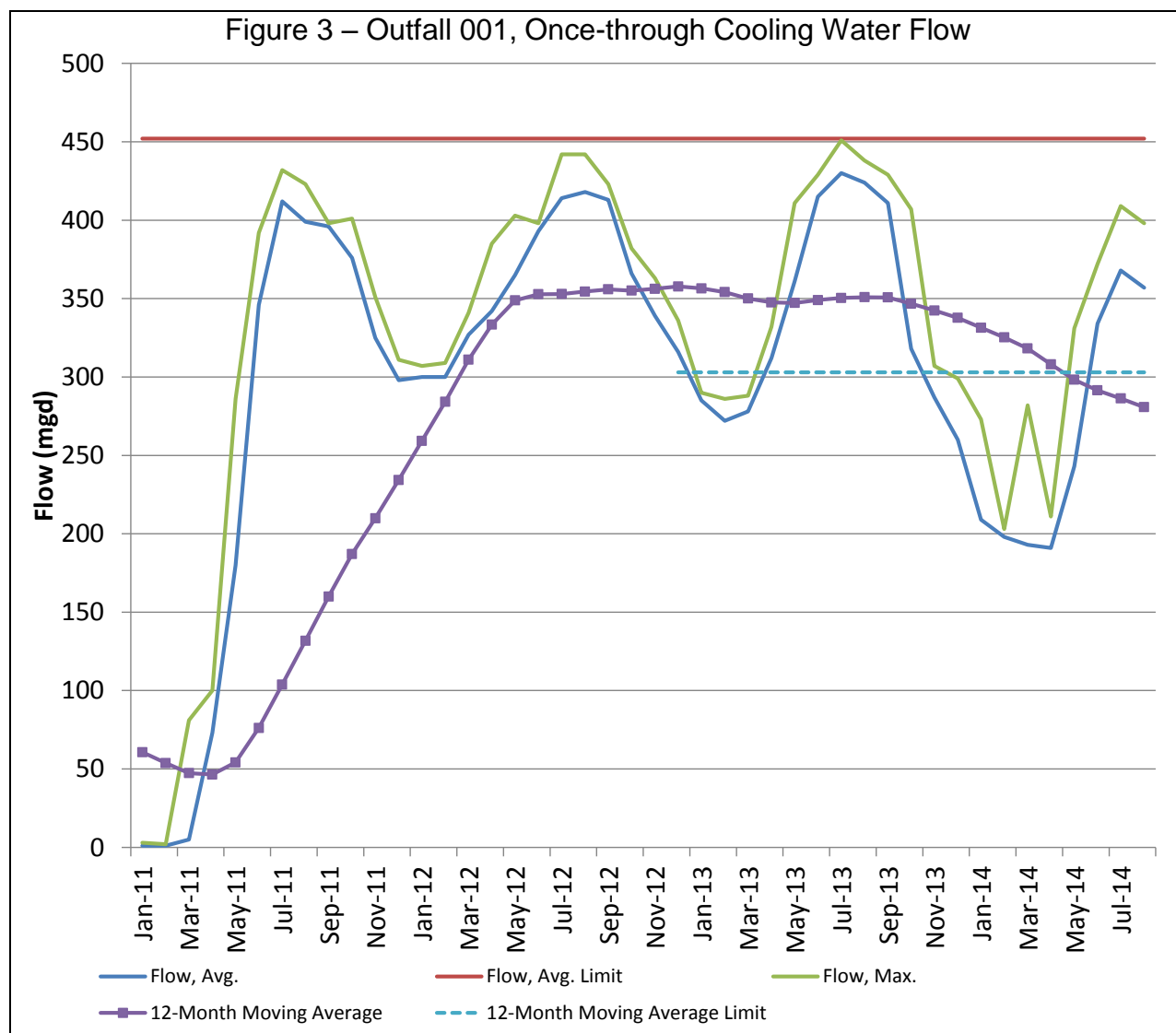
$$\text{Velocity} = \frac{\text{Flow}}{\text{Area}} = \frac{618.8 \text{ cfs} + 24.1 \text{ cfs}}{1,905 \text{ ft}^2} = \mathbf{0.34 \frac{\text{ft}}{\text{sec}}}$$

### ***Fish Return***

The permit requires that “the Fish Return System will satisfy the provisions of Section 125.92(s) of the 316(b) Rule (as promulgated on August 15, 2014)”. Cardno, on behalf of The Delaware City Refining Company, LLC, submitted a design for the fish return system on June 24, 2016 intended to be in compliance with this standard. The design includes a fish friendly Hidrostol pump to move fish from a large sump into the pressurized pipe. The pipe travels approximately 6,500 feet and discharges in the near-by Dragon Run Creek. This discharge location in Dragon Run Creek is nearby and directly connected to the source water body, and in a location protective of the fish being returned. DNREC approves this alternate discharge location. The Refinery will have to demonstrate that the operation of this system meets the requirements of Section 125.92(s) of the 316(b) Rule as well.

### ***Flow Reductions To Date***

The DCR has reduced surface water withdrawals from 452 million gallons per day (“mgd”), measured as a daily average, to 303 mgd, measured as a 12 month rolling average. This has been added to limit requirements for Outfall 001. Flow reductions will correspondingly reduce entrainment and impingement. This has been achieved by flow conservation and increased utilization of existing on-site cooling towers.



## Biomonitoring

The critical part of biomonitoring tests is to determine the appropriate “instream waste concentrations” (IWC), the effluent concentration at the edge of the regulatory mixing zones: acute, chronic, or both. The current permit uses an IWC of 39% for the acute mixing zone, based on CORMIX modeling by a Department-contracted consultant, Versar. The Delaware City Refinery has been passing the acute biomonitoring tests at 100% effluent.

The DRBC is assessing the need for a TMDL to allocate chronic toxicity in Delaware River Zones 5a and 5b. DCR discharges to Zone 5c, but is big and close enough to Zones 5a and 5b that the DRBC is including DCR’s effects in the assessment which includes the vicinity of DCR’s discharges. The DRBC has requested chronic biomonitoring for the Delaware City Refinery, in support of this TMDL effort.

If an effluent fails a biomonitoring test, Delaware’s standard biomonitoring special conditions require a “Toxicity Reduction Evaluation” (TRE) to identify toxicity sources, and reduce toxicity to non-toxic levels. Chronic biomonitoring is a good double-check that would require the refinery to correct any toxicity problems in the effluent that were not anticipated in their application or in the permit-required monitoring.

By itself, the DRBC request for chronic biomonitoring would mean that it would be in addition to acute biomonitoring. Based on the revised lower dilution factors, the permit changes from acute to chronic biomonitoring on a permanent basis.

Notably, the main reason for the chronic biomonitoring request from the DRBC is the observed chronic toxicity in the Delaware River, meaning that some toxicity in the non-contact cooling water could be due to toxicity in the intake. Consequently, the permit requires chronic biomonitoring at the discharge, and allows for comparative biomonitoring at the intake.

The Special Conditions include provisions for the permittee to request frequency reduction after the two years of successful chronic biomonitoring.

### ***PCBs, Dioxins, and Furans (PDxF)***

The United States Environmental Protection Agency (EPA) Regions II and III established Stage 1 Total Maximum Daily Loads (TMDLs) for polychlorinated biphenyls (PCBs) for Zones 2 through 5 of the Delaware Estuary on December 15, 2003. The EPA has provided that the Stage 1 TMDLs will be replaced by more refined Stage 2 TMDLs, based upon modeling for all ten PCB homologs and additional characterization of sources of PCBs. At the request of EPA Regions II and III and the States of New Jersey, Delaware and Pennsylvania, the Delaware River Basin Commission ("DRBC" or "Commission") is in the process of developing the Stage 2 TMDLs. Point source discharges are one of the several PCB source categories being evaluated as part of this effort. Therefore, in order to better characterize loadings of PCBs to the estuary and to develop and calibrate the additional PCB homolog models, additional data must be collected.<sup>13</sup>

Also, the TMDL requires narrative water quality-based effluent limits for PCBs, in the form of a program for each affected facility to implement a Pollutant Minimization Plan (PMP) to track down and reduce PCB sources. These PMP requirements are included in the new Special Condition No. 11.

Further, that new Special Condition No. 11 specifies monitoring requirements that are consistent with the PCB TMDL monitoring requirements. The DRBC's specifications for PCB TMDL monitoring are posted on the internet at [http://www.state.nj.us/drbc/PCB\\_info.htm](http://www.state.nj.us/drbc/PCB_info.htm).

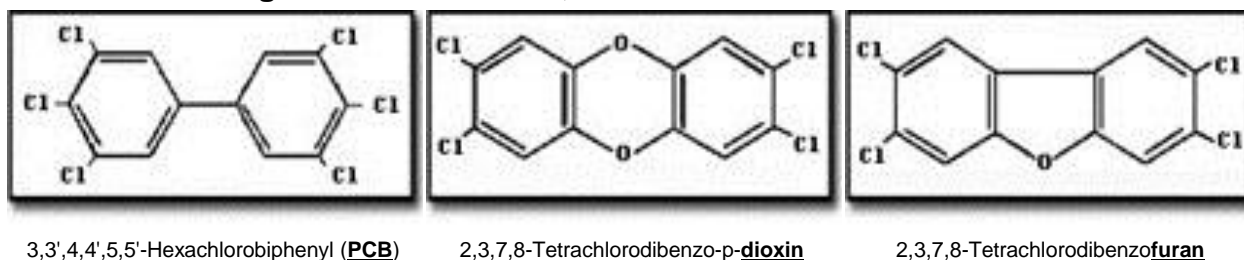
"The term 'dioxins' refers to polychlorinated dibenzo-p-dioxins (CDDs) and polychlorinated dibenzofurans (CDFs). These groups of chemicals are termed 'dioxin-like,' because they have similar chemical structure, similar physical-chemical properties, and invoke a common battery of toxic responses. CDDs and CDFs must have chlorine substitution of hydrogen atoms at the 2, 3, 7, and 8 positions on the benzene rings (29)."<sup>14</sup>

The discussion can be confusing, since PCBs are also considered a "dioxin-like" compound, and terminology can vary slightly, from reference to reference. The Figure below shows chemical structures, as an example, for one congener each of a PCB, a dioxin, and a furan.

<sup>13</sup> Further, Zone 5 of the Delaware River currently has a fish advisory, due to accumulations of PCBs, Arsenic, Dioxin, Mercury, and Chlorinated Pesticides in fish tissue. Discussed above under "Receiving Stream Classification", beginning on page 5.

<sup>14</sup> "Technical Support Document for the 2004 Effluent Guidelines Program", "§7.7 Dioxins", EPA-821-R-04-014, U.S.E.P.A., August 2004, [http://water.epa.gov/lawsregs/lawsguidance/cwa/304m/upload/2008\\_08\\_19\\_guide\\_304m\\_2004\\_tsd-section7.pdf](http://water.epa.gov/lawsregs/lawsguidance/cwa/304m/upload/2008_08_19_guide_304m_2004_tsd-section7.pdf)

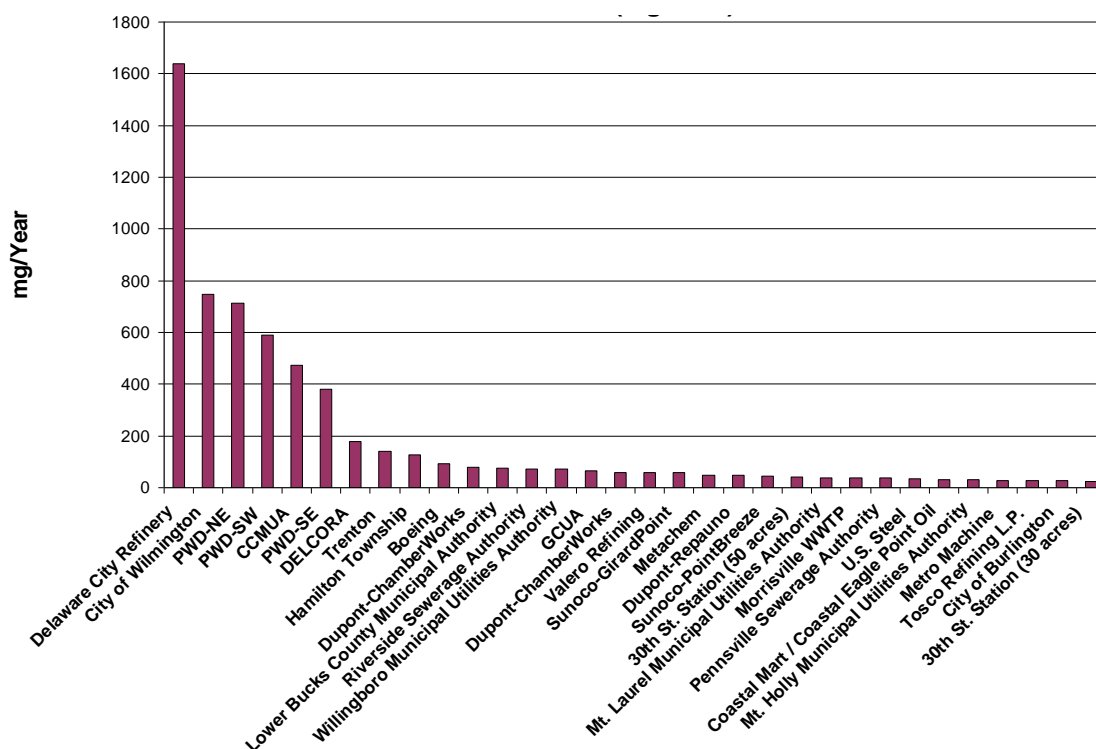
**Figure 4 – What PCBs, Dioxins and Furans Look Like**



Strictly speaking (and from left to right in the Figure above), PCBs have no oxygen atom in the middle, “dioxins” have 2 oxygen atoms (i.e., the self-explanatory “diox” in “dioxins”) in the middle, and furans have one oxygen in the middle. Otherwise, the differences between one congener and another are just the number and location of chlorine atoms around the perimeter of the molecules. The numbers at the beginning of the congener name provide the specific number of chlorine atoms, and the location of each.

The DRBC has already received some results for PCB congener testing for industrial and municipal dischargers in the Delaware Watershed, including the Delaware City Refinery, and has requested more monitoring from this site. The bar graph below, “Figure 5 – Penta PCB Loads in the Delaware River Watershed from NPDES Dischargers”, is from the earliest (2004-2005) sampling results, and identified the Delaware City Refinery as a large NPDES source of PCBs in the Delaware River Watershed, compared to the DRBC’s PCB monitoring results for other NPDES permitted facilities in the watershed.

**Figure 5 – Penta PCB Loads in the Delaware River Watershed from NPDES Dischargers**



Per DRBC requirements, the permittee has a Pollutant Minimization Plan (PMP) and has been doing monitoring and trackdown to identify PCB sources within the facility. The following two Figures summarize changes in PCB loads since then.



Figure 6 – PCB Load per Outfall, for Outfalls That DO Have Intake from the Delaware River

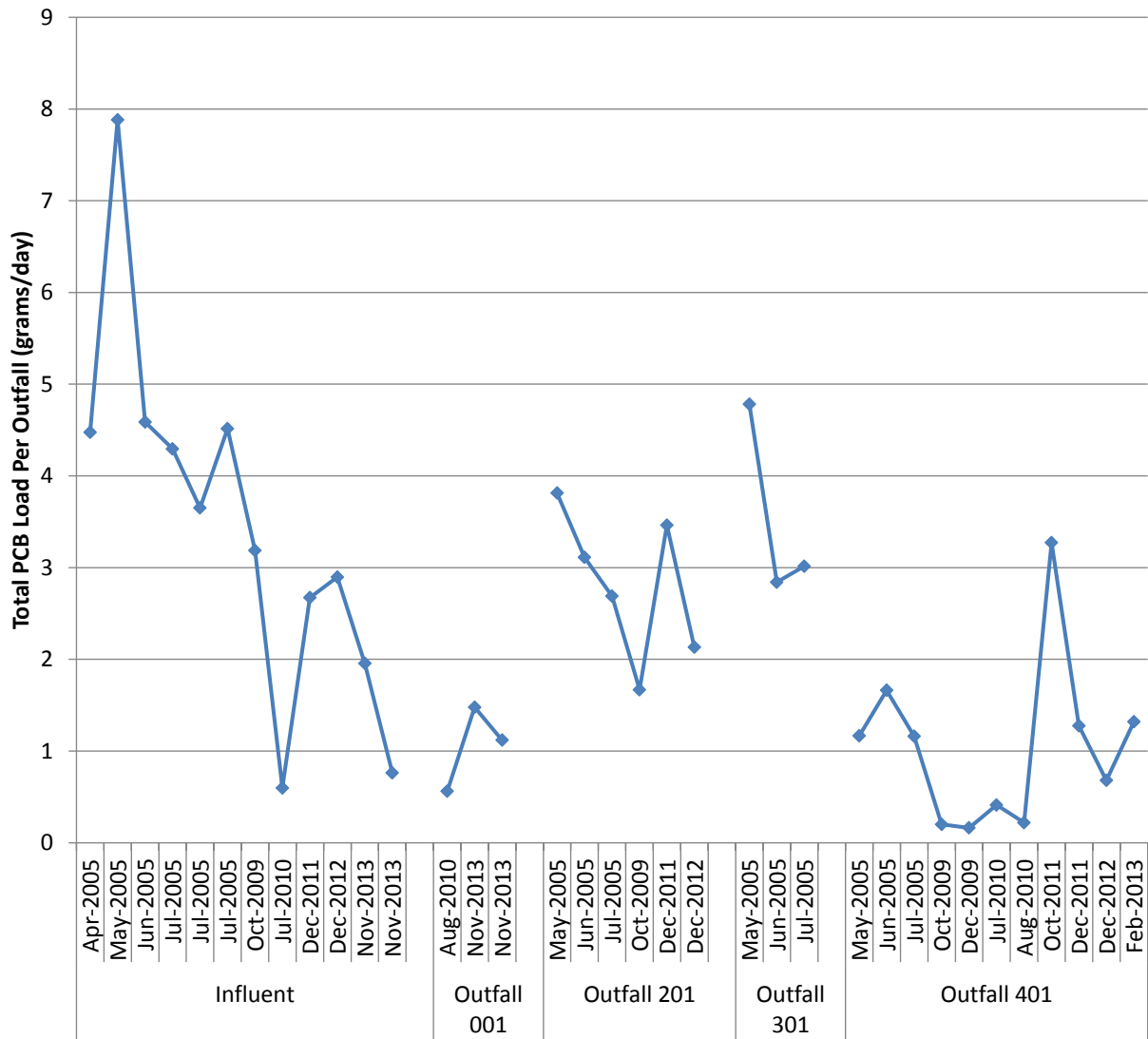
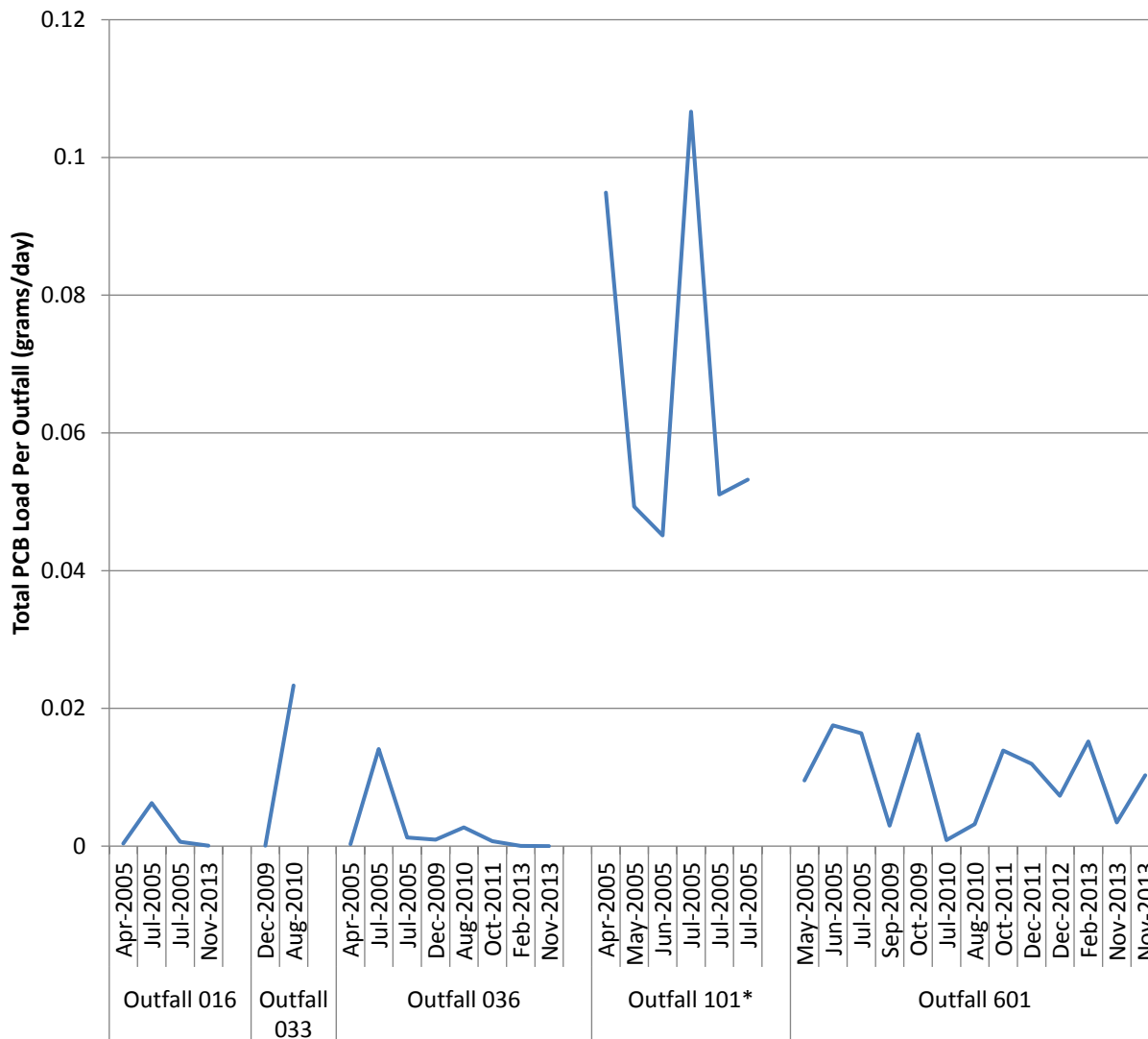


Figure 7 – PCB Load per Outfall, for Outfalls That DO NOT Have Intake from the Delaware River



\*Outfall 101 is the discharge from Guard Basin 4 (GB4). Contaminated sediments have been removed from Guard Basin 4, and flows have been directed away from GB4 into GB5 and GB6. See discussion under "Guard Basins" heading, beginning on page 27.

Considering the monitoring results to date, the lack of monitoring results for Outfall 009, and the TMDL requirements, the permit includes the following PCB congener monitoring requirements.

Table 5 – Congener Monitoring				
Outfall	PCBs		Dioxins and Furans	
	Frequency	Wet/Dry Weather Samples	Frequency	Wet/Dry Weather Samples
001	Annually	Dry	---	---
009	Annually	Wet	---	---
016	Annually	Wet	---	---
017	Annually	Wet	---	---
033	Annually	Wet	---	---
036	Annually	Wet	---	---
101*	Semi-annually	Wet	Semi-annually	Wet
	Semi-annually	Dry	Semi-annually	Dry
601	Annually	Dry	Annually	Dry
<p>* Outfall 001 samples shall be taken at both the Outfall 001 and at the Intake from the Delaware River.</p> <p>** Outfall 101 PCB, dioxin and furan monitoring is only required if any water enters Guard Basin 4 other than storm water that falls onto the footprint of the basin and storm water from the immediately adjacent and contiguous remediation cell of the former sediments from Guard Basin 4, or from the remediation area of the former "Oily spoils area".</p>				

The permit requires congener monitoring for dioxins and furans, considering the fish advisory for dioxins in the Delaware River, the similarity of dioxins and furans to PCBs as discussed above, and EPA's sampling studies that have identified some processes within refineries as sources of dioxins and furans. See "Table 4. – State of Delaware 2012 Combined Watershed Assessment Report (305(b)) and Determination for the Clean Water Act Section 303(d) List of Waters Needing TMDLs", on page 7 of this Fact Sheet.

## PDxF Monitoring for Outfall 601 and for Upstream Sources

DCR currently monitors PCB congeners at Outfall 601. The proposed permit requires monitoring for congeners of PCBs, dioxins and furans (PDxF) for Outfall 601 and for upstream sources, as provided in the third note in Table 5 above.

The U.S. EPA has specifically identified some petroleum refining processes as sources of "dioxins and dioxin-like compounds".

"Dioxin and dioxin-like compounds are not manufactured, but are generated as byproducts of certain chemical and combustion processes. As discussed in Section 7.3.3.3, **EPA identified catalyst regeneration operations for the catalytic reforming process as the source of dioxins generated at petroleum refineries** (24, page G-1). Smaller quantities of dioxins might be generated in isomerization units (37). See Section 7.3.3.3 for a detailed description of reforming catalyst wastewater generation."<sup>15</sup>

The DCR does have on-site "catalyst regeneration operations for the catalytic reforming process", but no isomerization units. §7.3.3.3 referenced above does discuss three different "Reformer Catalyst Regeneration Processes", summarized in the Table below.

<sup>15</sup> "Technical Support Document for the 2004 Effluent Guidelines Program", "§7.7.3, Dioxin Sources at Petroleum Refineries", EPA-821-R-04-014, U.S.E.P.A., August 2004, [http://water.epa.gov/lawsregs/lawsguidance/cwa/304m/upload/2008\\_08\\_19\\_guide\\_304m\\_2004\\_tsd-section7.pdf](http://water.epa.gov/lawsregs/lawsguidance/cwa/304m/upload/2008_08_19_guide_304m_2004_tsd-section7.pdf)

**Table 6 – Reformer Catalyst Regeneration Processes in 2000<sup>16</sup>**

Type of Regeneration Process	Number of Refineries	Percentage of Refineries With Catalytic Reforming
Semi-regenerative	33	27%
Cyclic	21	17%
Continuous	74	61%
Not specified	10	8%
<b>Total</b>	<b>122</b>	

DCR uses the continuous process.

### **PDxF Requirements in the “Toxics Release Inventory” (TRI) and in the “Delaware Surface Water Quality Standards” (DeSWQS)**

The TRI requires reporting of “dioxin and dioxin-like compounds” as the sum of seventeen (17) individual dioxins and furans. The TRI requires reporting of polychlorinated biphenyls (PCBs) separately from other “dioxins and dioxin-like substances”. “PCBs” are reported as the total of 209 PCB congeners.<sup>17</sup> However, the TRI does not require PCB reporting below a “threshold” of 10 pounds per year.

Air emission reductions were the result of facility improvements such as the addition of a scrubber unit to their catalyst regeneration process. While the air emission reductions shown above are laudable, bearing in mind the shutdown, there is also reasonable concern that “dioxins and dioxin-like compounds” were re-directed to wastewater treatment, with the addition of this scrubber unit. New monitoring requirements should help quantify how much PDxF is removed by water treatment.

The Delaware Surface Water Quality Standards (DeSWQS) has the following requirements that apply to PCBs, dioxins and furans (PDxF):

**Table 7 – WATER QUALITY CRITERIA FOR PROTECTION OF HUMAN HEALTH<sup>18</sup>**

(All Values Are Listed in Micrograms per Liter)

Chemical	Systemic Toxicants		Human Carcinogens	
	Fish Ingestion	Fish and Water Ingestion	Fish Ingestion	Fish and Water Ingestion
2,3,7,8-TCDD (Dioxin) (as TEQ*)		0.00003 (MCL)	5.1E-09	5.0 E-09
Polychlorinated Biphenyls PCBs:		0.5 (MCL)	0.000064	0.000064

The note to “2,3,7,8-TCDD (Dioxin) (as TEQ\*)” is as follows in the Table below:

<sup>16</sup> “Table 7-3. Reformer Catalyst Regeneration Processes in 2000”, U.S. Department of Energy, Petroleum Supply Annual 2000, Volume 1. Energy Information Administration; and Oil & Gas Journal, “2001 Worldwide Refining Survey.” Volume 99.52, December 24, 2001

<sup>17</sup> PCB Congener Definition and Table of 209 PCB Congeners,  
<http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/congeners.htm>

<sup>18</sup> <http://regulations.delaware.gov/AdminCode/title7/7000/7400/7401.pdf>, pgs. 16 and 18.

"Criteria is for the "total toxic equivalence (TEQ) to 2,3,7,8-TCDD". The toxic equivalence for a sample is the sum of the concentration for each congener multiplied by its associated Toxicity Equivalence Factor (TEF) listed in table below.  $TEQ = ((\text{Concentration of Congener in sample}) \times (\text{TEF}))$  where the TEF is unitless and the concentration is in ug/l.

Congener	TEF value	Congener	TEF value
<i>Dibenzo-p-dioxins</i>		<i>Non-ortho PCBs</i>	
2,3,7,8-TCDD	1	PCB 77	0.0001
1,2,3,7,8-PnCDD	1	PCB 81	0.0003
1,2,3,4,7,8-HxCDD	0.1	PCB 126	0.1
1,2,3,6,7,8-HxCDD	0.1	PCB 169	0.03
1,2,3,7,8,9-HxCDD	0.1		
1,2,3,4,6,7,8-HpCDD	0.01	<i>Mono-ortho PCBs</i>	
OCDD	0.0003	PCB 105	0.00003
		PCB 114	0.00003
<i>Dibenzofurans</i>		PCB 118	0.00003
2,3,7,8-TCDF	0.1	PCB 123	0.00003
1,2,3,7,8-PnCDF	0.03	PCB 156	0.00003
2,3,4,7,8-PnCDF	0.3	PCB 157	0.00003
1,2,3,4,7,8-HxCDF	0.1	PCB 167	0.00003
1,2,3,6,7,8-HxCDF	0.1	PCB 189	0.00003
1,2,3,7,8,9-HxCDF	0.1		
2,3,4,6,7,8-HxCDF	0.1		
1,2,3,4,6,7,8-HpCDF	0.01		
1,2,3,4,7,8,9-HpCDF	0.01		
OCDF	0.0003		

A "Pollutant Minimization Plan" (PMP) for PCB's was originally submitted for this facility on October 4, 2005. However, the PCB Pollutant Minimization Plan submittals only characterize PCBs per DRBC requirements and, therefore, have not quantified PDxF in wastewaters from the DCR "catalyst regeneration operations for the catalytic reforming process". New Special Conditions Nos. 11 and 12 specifically require PDxF trackdown for sources upstream of Outfall 601, if sample results at Outfall 601 exceed DeSWQS.

Concomitant with the addition of Special Conditions No. 11 and 12, Special Condition No. 2 of the old permit for the Delaware City Power Plant (DCPP) has been deleted. It required "no discharge" of PCBs, based on Federal Effluent Limitation Guidelines under 40 CFR 423.12(b)(2) for Power Plants<sup>19</sup> "primarily engaged in the generation of electricity for distribution and sale" of electricity.<sup>20</sup> The DCPP's power production is no longer distributed, but is captive to and serves the Delaware City Refinery.

The Department has discretion to continue to apply those guidelines for Power Plants, on a "Best Professional Judgment" (BPJ) basis, but the old Special Condition No. 2 made sense with the old PCB test method 8082.<sup>21</sup> However, the newer test Method No. 1668A, has sensitivities to congeners that are

<sup>19</sup> 40 CFR Part 423, "Steam Electric Power Generating Point Source Category"

<sup>20</sup> 40 CFR [423.10](#) "Applicability"

<sup>21</sup> The MDLs for Aroclors vary in the range of 0.054 to 0.90 µg/L in water and 57 to 70 µg/kg in soils, with the higher MDLs for the more heavily chlorinated Aroclors." EPA "Method 8082, Polychlorinated Biphenyls (PCBs) By Gas Chromatography," Section 9.1, "Performance", page 8082-18., Dec., 1996, <http://www.epa.gov/epaoswer/hazwaste/test/pdfs/8082.pdf>

100 to 225,000 times more sensitive<sup>22</sup> than the older Method No. 8082. Method 1668A is sufficiently sensitive even to detect PCBs deposited from the atmosphere onto the site. Moreover, the TMDL for PCBs provides a much better regulatory path for addressing PCB problems in the Delaware River. The intent of changes in the permit Special Conditions is to identify and reduce any potential PCBs added by the site to the Delaware River, consistent with the estuary TMDL approach.

## **PCB Monitoring for Storm Water Outfalls 009, 016, 017, 033 and 036**

Per DRBC requirements, the DCR & DCPD complex has been sampling PCBs at various locations since 2005.

Concentration-wise, the Outfalls that stand out for high concentrations are Outfalls 016, 033 and 036. Sample results from years 2009 through 2013 generally appear to have lower levels than initial results from 2005. Bear in mind that if the Outfall has very low flow, the PCB load may be relatively low. Still, concentration results may indicate relatively easy opportunities for PCB discharge reductions.

The site's PCB Pollutant Minimization Plan (PMP) already has PCB monitoring for Outfalls 016, 017, 033 and 036.

The proposed permit adds PCB monitoring for Outfall 009, a "storm water only" outfall that includes run-off from the railroad spur that was constructed with the Refinery in the 1950's. Any congeners found would likely be due to past activities. However, if congeners were in railroad spur run-off, they would have accumulated in sediments at the bottom of storm water conveyances. Those sediments would then act as PCB banks, continuing to release congeners over time. For example, if PCBs are found in Outfall 009, PMP's at other NPDES permittees have included sediment clean-outs, eliminating a PCB load source going forward.

## **Water Quality Review**

Circa 2008, the permittee submitted NPDES Application Form 2C for Outfalls: 001, 101, 201, 301, 401, 501, 601, 701, and Form 2D for 901/902 (combined discharge from the Wet Gas Scrubbers). The permittee submitted NPDES Application Form 2F for storm water outfalls 002, 003, 004, 005, and 006, 007, 008, and 009. Those results and the DMR data were reviewed regarding compliance with State water quality and technology-based standards, as well as with federal ELG's. The data review is based on procedures delineated in EPA's "Technical Support Document for Water Quality-based Toxics Control"<sup>23</sup> (the "TSD"). "Table 8 – Regulatory Bases for Effluent Limitations and Monitoring" on page 24 below summarizes the results of that analysis. This review is also known as the "Reasonable Potential Analysis", since it checks for reasonable potential for a pollutant to cause or contribute to exceedances of water quality requirements.

In short, most of the pollutants identified as needing limits already have appropriate limits in the permit. The limiting criteria in most cases are the Technology-Based Standards from the *Delaware Regulations Governing the Control of Water Pollution* ([RGCWP](#)), §7.03(a).

## **Dilution Factors**

In the early 1990's DNREC contracted Versar to evaluate the compliance status of DCR's (then Star Enterprises) discharge with DeSWQS for thermal discharges. The resulting 1992 Versar reports included CORMIX modeling that established dilution factors for the acute and chronic mixing zones, for the discharge canal at its discharge point into the Delaware River.

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<sup>22</sup> EPA "Method 1668, Revision A: Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by HRGC/HRMS", pages 75 through 83, USEPA, EPA No. EPA-821-R-00-002, December 1999. This test method is not a 40 CFR 136 test method. <http://www.epa.gov/Region8/water/wastewater/biohome/biosolidsdown/methods/1668a5.pdf>.

<sup>23</sup> U.S. EPA, Office of Water (EN-336), March, 1991, EPA/505/2-90-001, PB91-127415, <http://water.epa.gov/scitech/swguidance/standards/mixingzones/docs.cfm>

The flow limit for DCR's Outfall 001 is 452 mgd; this flow includes the DCPD outfall flows mentioned above. As an initial screening for pollutants of concern, the water quality review uses dilution factors (DF) based on

$$DF = \left( \frac{\text{Outfall 001 Flow Limit}}{95\text{th Percentile Avg. Flow for Each Outfall}} \right) (\text{Outfall 001 Dilution Factor})$$

In the TSD water quality review referenced above, the chronic and far field dilution factors (Human health, systemic and carcinogenic) were assumed to be the same. Using the 95th percentile flow for all Outfalls (except Outfall 001) provides a conservatively low dilution factor to use for the screening. Of course, water quality concerns are of most interest for Outfall 001, since it is the final and inclusive outfall for the permittee's non-storm water discharges to the Delaware River. The pollutants of most interest are those that are both detected and flagged for limits or monitoring.

### ***Effluent Limitations Guidelines Limits***

Outfall 601 limits (for parameters other than flow) may be increased by approximately 20%, considering only the Federal Effluent Limitation Guidelines (ELG's) from 40 CFR 419. Limit calculations include allowances for pollutants in the intake, as well as adjustments for pollutants in storm water, as established in the current permit issued on July 27, 1997. However, the Department proposes to retain the current Outfall 601 permit limits, considering performance of the discharge [40 CFR 122.45(b)(2)], anti-backsliding requirements [40 CFR 122.44(l)], and anti-degradation requirements [40 CFR 131.12 and SWQS §3].

### ***Proposed Effluent Limitations***

DNREC has examined the application, recent discharge monitoring data and related information and proposes to reissue this NPDES permit for a period not to exceed five (5) years, subject to the effluent discharge limitations and monitoring requirements shown in the attached permit.

### **Regulatory Bases for Effluent Limitations**

The following table summarizes the bases for the proposed effluent limitations and monitoring requirements.

Table 8 – Regulatory Bases for Effluent Limitations and Monitoring						
Outfall	Parameter	Water Quality- Based <sup>24</sup>	Technology-Based			
			DRBC <sup>25</sup>	Effluent Limitation Guideline	Performance <sup>26</sup>	RGCWP <sup>27</sup>
001	Flow				✓	
	pH	§§11.1 & 11.3				
	Oil & Grease				✓	
	Total Residual Chlorine			40 CFR 125.3 & 423.13(b) <sup>4</sup>		
	Temperature	§§4.5.1 & 6.4.2	\$4.30.6 <sup>28</sup>			
	Biomonitoring	§4.6.3	✓			
	"Free From ..."	§4.1.1				
011*	Flow				✓	
	Total Suspended Solids			40 CFR 423.12(b)(3)	✓	
	pH			40 CFR 423.12(b)(1)		
	Oil & Grease			40 CFR 423.12(b)(5)		§7.3.1.15
	Iron					§7.3.1.8
013*	Outfall deleted as redundant to 401					
015*	Outfall deleted. Flow redirected to wastewater treatment plant.					
016* & 017*	Flow				✓	
	Total Suspended Solids			40 CFR 423.12(b)(3)		
	Oil & Grease			40 CFR 423.12(b)(3)		§7.3.1.15
	pH			40 CFR 423.12(b)(1)		
	"Free From ..."	§4.1.1				
035*	Flow				✓	
	Total Suspended Solids			40 CFR 423.12(b)(3)		
	Oil & Grease			40 CFR 423.12(b)(3)		§7.3.1.15
	pH			40 CFR 423.12(b)(1)		
101	Flow				✓	
	Total Suspended Solids			40 CFR 419.22		
	Oil & Grease			40 CFR 419.22		
	PCBs		✓			
	Dioxins and Furans	✓				
201	Flow				✓	
	Total Organic Carbon			40 CFR 419.22		
301	Oil & Grease					§7.3.1.15
401	Flow				✓	
	Aluminum	✓				
	BOD5	✓				
	Iron	✓				
	Total Organic Carbon			40 CFR 419.22		
	Turbine Heat Rejected	§§4.5.1 & 6.4.2				
	"Free from ..."	§4.1.1				
501a&b	Flow				✓	
	"Chlorination prohibited"	Marine Chronic		40 CFR 125.3 & 423.13(b)		

<sup>24</sup> State of Delaware Surface Water Quality Standards, as amended September 1, 2017. See <http://regulations.delaware.gov/AdminCode/title7/7000/7400/7401.shtml>.

<sup>25</sup> See <http://www.state.nj.us/drbc/library/documents/watercode.pdf> and <http://www.state.nj.us/drbc/library/documents/WQregs.pdf>.

<sup>26</sup> 40 CFR 122.45(b)(2)(i)

<sup>27</sup> State of Delaware Regulations §7201, "Governing the Control of Water Pollution" (RGCWP), as amended September 1, 2012. See <http://regulations.delaware.gov/AdminCode/title7/7000/7200/7201.shtml#TopOfPage>.

<sup>28</sup> Temperature limits were originally based on the maximum allowable temperature requirements of Delaware River Basin Commission (DRBC) regulations. DNREC contracted Versar, Inc. to evaluate the discharge for compliance with Delaware's SWQS for temperature. Currently, the Delaware and DRBC water quality standards (including the allowable mixing zone) for temperature are identical. Based on CORMIX modeling of the discharge under critical conditions, Versar determined that the discharge does comply with the SWQS.



Table 8 – Regulatory Bases for Effluent Limitations and Monitoring (continued)						
Outfall	Parameter	Water Quality- Based <sup>29</sup>	Technology-Based			
			DRBC <sup>30</sup>	Effluent Limitation Guideline	Performance <sup>31</sup>	RGCWP <sup>32</sup>
601	Flow				✓	
	Ammonia (as N)			40 CFR 419.23		
	BOD <sub>5</sub>			40 CFR 419.23		
	Chromium, Hexavalent			§40 CFR 419.23		
	Chromium, Total			§40 CFR 419.23		
	Cyanide, Free	Marine Acute				
	Dioxins and Furans	§4.2.1.1.3				
	Iron, Total**					§7.3.1.8
	Nitrates	§4.6.2				
	Nitrites	§4.6.2				
	Nitrogen	§4.6.2				
	Oil & Grease			40 CFR 419.22		
	PCBs		✓			
	Phenolic Compounds			§40 CFR 419.23		
	Selenium, Total**					§7.3.1.10
	Sulfides			40 CFR 419.23		
	Total Kjeldahl Nitrogen	§4.6.2				
	Total Organic Carbon			40 CFR 419.23		
	Total Suspended Solids			40 CFR 419.22		
701	Vanadium, Total	§4.6.3				
	free from ...	§4.1.1				
	Flow				✓	
701	Temperature	§§4.5.1 & 6.4.2				
	Chlorination prohibited	Marine Chronic		§§40 CFR 125.3 & 423.13(b)		
Notes:	<p>* These Outfalls were formerly under the Delaware City Power Plant NPDES Permit No. DE0050601.</p> <p>** New limits, based on RGCWP as referenced, and concentrations reported in the Dec. 3, 2010 permit application.</p>					

As mentioned above, Outfall 013 and Outfall 401 are duplicate outfalls. Until the effective date of this proposed permit, the power plant and refinery NPDES permits were separate permits and permittees. Outfall 013 was monitored by the power plant where their discharge exited their site, and Outfall 401 was monitored by the refinery where that same discharge entered the refinery.

DCRC updated its permit application in December 2010. The sites were still under different NPDES permits (DE0050601 for the power plant and DE0000256 for the refinery), so DCRC submitted separate application forms for Outfalls in both DE0050601 and DE0000256. Requirements for Outfall 401 consider information in those applications for both Outfall 013 and Outfall 401. When data in the two applications did not match, the higher value was used for the “Reasonable Potential Analysis”, discussed above under on page 18, to be conservatively protective of the receiving waters.

## Bases for Effluent Limitations for Outfalls Containing Storm Water Only

Twenty-one (21) Outfalls discharge only storm water: 002, 003A, 003B, 004, 005, 006, 007, 008, 009, 031\*, 032\*, 033\*, 034, 036\*, 043, 044, 045, 046, 053, 054, and 055 (“\*” indicates Outfalls formerly under the Delaware City Power Plant Permit No. DE0050601). Each of these Outfalls has narrative limits that state, “The discharge shall be free from floating solids, sludge deposits, debris, oil, and scum.” That limit is based on the State of Delaware Surface Water Quality Standards, “Section 4: Criteria to Protect Designated Uses.”

<sup>29</sup> State of Delaware Surface Water Quality Standards, as amended June 1, 2011. See <http://regulations.delaware.gov/AdminCode/title7/7000/7400/7401.shtml>.

<sup>30</sup> See <http://www.state.nj.us/drbc/library/documents/watercode.pdf> and <http://www.state.nj.us/drbc/library/documents/WQregs.pdf>.

<sup>31</sup> 40 CFR 122.45(b)(2)(i)

<sup>32</sup> State of Delaware Regulations §7201, “Governing the Control of Water Pollution” (RGCWP), as amended September 1, 2012. See <http://regulations.delaware.gov/AdminCode/title7/7000/7200/7201.shtml#TopOfPage>.

## Storm Water Discharges to Red Lion Creek and Dragon Run Creek

The receiving waters (Dragon Run Creek and Red Lion Creek) have high levels of bacteria and excess nutrients and do not fully support their designated uses. To address those impairments of designated uses, the Department developed and promulgated nutrient (nitrogen and phosphorus) and bacteria (enterococcus) Total Maximum Daily Loads (TMDLs).<sup>33</sup> The TMDLs stipulate that the nitrogen, phosphorus and bacteria loads are to be reduced by 40 percent from the 2002-2005 baseline levels. The long-term average target threshold values for both watersheds are 3.0 mg/L for total nitrogen and 0.2 mg/L for total phosphorus.

Data submitted with the permit renewal application show that several of DCR's storm water discharges already meet the TMDL targets for nitrogen and phosphorus. The referenced application did not include enterococcus monitoring results. Based on the storm water quality indicated by nitrogen and phosphorus levels, and the absence of enterococcus monitoring results, the permit requires annual nitrogen, phosphorus, enterococcus monitoring for Outfalls 005, 006, 007, 043, 044, 045, 046, 053, 054, and 055.

Table 9 – Storm Water Monitoring Results, mg/L (from Form 2F's in Updated NPDES Application, dated Dec. 1, 2010)			
Outfall	Watershed	Nitrogen	Phosphorus
005	Dragon Run Creek	3.54	0.345
007		1.25*	0.24*
006	Red Lion Creek	0.255	0.265
032		1.27	0.04
033		1.25	0.06
TMDL long-term average targets		3.0	0.2
Note *Reported as “Maximum Value, Flow-Weighted Composite”			

Further, to ensure that storm water run-off continues to meet TMDL goals, the permit requires that the storm water plan (which includes related monitoring) specifically address nutrients and bacteria in storm water runoff from the facility. These limitations are based on and are consistent with the requirements outlined in the Department's NPDES General Permit Program *Regulations Governing Discharges of Storm Water Associated with Industrial Activities*.

## Wet Gas Scrubbers

In recent years the Delaware City Refinery installed "Regenerative Wet Gas Scrubbers" (WGS) on the Fluid Catalytic Cracker Unit (FCCU) and the Fluid Coker Unit (FCU), to reduce sulfur dioxide emissions to the air. The WGS converts the sulfur dioxide gases to saleable molten sulfur. The WGS wastewater discharge is to the on-site wastewater treatment facility (WWTF). The WWTF effluent is the existing Outfall 601.

For start-up of the scrubbers, the permittee monitored newly designated "outfalls", Outfall 901 for the FCCU effluent and Outfall 902 for the FCU effluent. In identifying and prioritizing pollutant monitoring, the following information sources were considered:

1. NPDES "Application Form 2C – Wastewater Discharge Information" (for existing discharges),
2. NPDES "Application Form 2D, New Sources and New Dischargers: Application for Permit to Discharge Process Wastewater",
3. "The Wet Gas Scrubber Study" submitted with the NPDES Application Form 2D
4. The "Toxics Release Inventory", and
5. Discharge Monitoring Report (DMR) data from Delaware NPDES facilities that have handled caustic produced with the chlor-alkali process.

<sup>33</sup> "Total Maximum Daily Loads (TMDLs)", <http://www.dnrec.delaware.gov/swc/wa/Pages/WatershedAssessmentTMDLs.aspx>

The start-up NPDES monitoring of the WGS effluents was intended to

1. Check the facility's projections of pollutants discharged,
2. Determine if the new discharge into the facility's WWTF has a reasonable potential to cause or contribute to exceedances of water quality standards,
3. Ensure that the new discharge will not interfere with or pass through the WWTF, and
4. Meet various NPDES regulatory requirements.

The permittee has provided monthly average flow results and up to 70 sample results of potential pollutants identified as possible in the WGS discharges to the WWTF.

In general, where the water quality review indicates redundant monitoring for Outfalls 001, 101, and 601, the permit focuses monitoring on Outfall 601 to quantify pollutants added by the site, instead of pollutants from the cooling water intake.

In negotiations on WGS start-up monitoring, the permittee stated that the site will not use caustic produced from the mercury cell chlor-alkali process. In the mercury cell process, water comes into direct contact with liquid mercury. Mercury cell caustic produced also raises concerns about potential contamination from cadmium, chromium, copper, iron, mercury, and lead (plus concerns about vanadium and nickel, but to a lesser degree). Consequently, the permit limits page for Outfall 601 states, "Use of caustic produced using the mercury cell chlor-alkali process is prohibited."

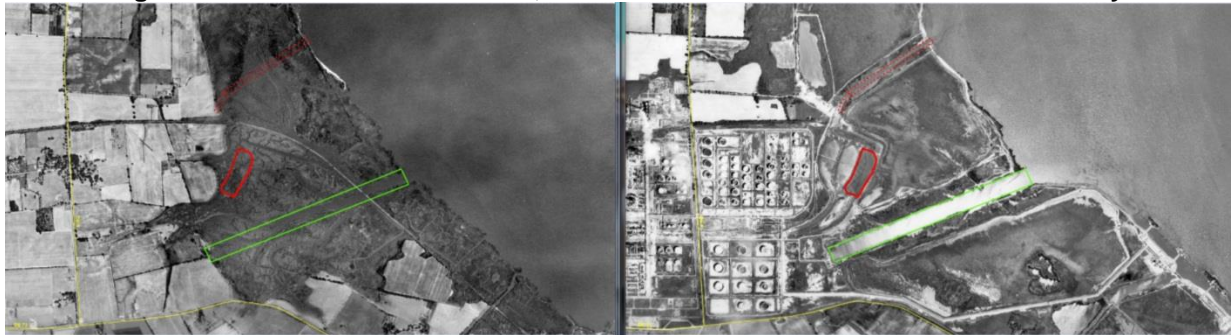
## Guard Basins

Guard Basins 4, 5, and 6 are original equipment at the DCR.

"Normal operation of the refinery does not contaminate the cooling water, but these Guard basins insure that oil from accidental leaks will not reach the Delaware River."<sup>34</sup>

The Figure below shows the Guard Basins location, before and after construction of the DCR in the 1950's.

**Figure 8 – Guard Basins Location, Before and After Construction of the Refinery**



Red outline is Guard Basin 4 (GB4). Guards Basins are numbered, right to left, as "4", "5", and "6". Red-dashed outline is the main discharge Channel. Green outline is the intake channel (aka "Cedar Creek").

Federal Regulations require that NPDES permits include several provisions that apply to these Guard Basins, not to mention the entire Refinery. Those requirements are also in both the Delaware "Regulations Governing the Control of Water Pollution" (RGCWP) and in the Standard Conditions of the site's current NPDES permit No. DE0000256, as summarized in the table below.

<sup>34</sup> H.P. Evans and E.E. Elliott, "Four separate systems needed for Cooling Water", from the "Oil and Gas Journal", May 27, 1957. "Engineering and design were done by engineers of Tidewater Oil Co. and C. F. Braun & Co. working together. Braun handled construction of the refinery". Authors are, respectively, consultant and project senior engineer C. F. Braun & Company.

Table 10 – Federal and State Requirements			
Provisions	Federal Regulations*	De. RGCWP**	Permit Standard Conditions
Proper Operation and Maintenance	40 CFR §122(d)	§6.14.13	Part II.A.3 on page 21
Duty to Mitigate	40 CFR §122(e)	§6.14.14	Part II.A.4 on page 21
Upset***	40 CFR §122(n)	§6.14.19	Part II.A.9 on page 22
<p>Notes:</p> <p>* See <a href="http://www.ecfr.gov/cgi-bin/text-idx?SID=7b428076728848bac17bd561663b33e0&amp;node=pt40.22.122&amp;rgn=div5">http://www.ecfr.gov/cgi-bin/text-idx?SID=7b428076728848bac17bd561663b33e0&amp;node=pt40.22.122&amp;rgn=div5</a></p> <p>** See <a href="http://regulations.delaware.gov/AdminCode/title7/7000/7200/7201.pdf">http://regulations.delaware.gov/AdminCode/title7/7000/7200/7201.pdf</a></p> <p>*** Per Federal and State Regulations an “upset” can be claimed as an “affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations”, but regulations disallow that defense if equipment is not properly operated and maintained, among other requirements.</p>			

Moreover, 40 CFR Part 112 has further requirements regarding “Oil Pollution Prevention”.<sup>35</sup>

Over the years, Guard Basins have been allowed to fill in with settled materials. The proposed permit includes a new Special Condition No. 7 with specific requirements regarding proper operation and maintenance of the No. 2 API Separator and Guard Basins 5 and 6. Treated wastewater effluent and storm water previously discharged through Guard Basin 4 has been re-routed through Guard Basins 5 and 6; therefore, Guard Basin 4 is currently not in service. The permittee has indicated that there are no plans to place Guard Basin 4 back into service at this time.

## Special Conditions

Special Condition No. 1 states that this permit supersedes the State Permit WPCC 3256C/74 and NPDES Permit DE 0000256 issued on July 27, 1997. The DE0050601 NPDES permit, formerly a separate permit for the Delaware City Power Plant, is subsumed into this permit. So this Special Condition also states that permit also supersedes NPDES Permit DE0050601/State Permit WPCC 3049C/76, effective on July 1, 2002 as amended through August 16, 2004.

Special Condition No. 2 is a standard permit reopener clause that provides for the Department to reopen and modify the permit if the discharge is causing water quality problems.

Special Condition No. 3 (New) requires the submission of NPDES application forms for all Outfalls. The permittee did submit updated applications in December 2010, but data for those Application Forms did not meet requirements that samples must be less than three years old.

Special Condition No. 4 (New) requires “Sufficiently Sensitive Test Methods”. On August 19, 2014, EPA published a Final Rule for “Use of Sufficiently Sensitive Test Methods for Permit Applications and Reporting.” That rule clarifies that NPDES applicants and permittees must use EPA-approved analytical methods capable of detecting and measuring pollutants at or below applicable water quality criteria or permit limits. The final rule is based on CWA requirements and clarifies existing EPA regulations. The amendments in that rulemaking affect only chemical-specific methods; they do not apply to Whole Effluent Toxicity methods or their use. The Federal Register publication is available at <https://federalregister.gov/a/2014-19265>.

Special Condition No. 5 addresses the DRBC's wasteload allocation and its requirements of 87.5 percent BOD removal in Zone 5 of the Delaware River.

Special Condition No. 6 requires Department approval before the permittee may use new cooling water treatment chemicals.

<sup>35</sup> [http://www.ecfr.gov/cgi-bin/text-idx?SID=7b428076728848bac17bd561663b33e0&node=pt40.22.112&rgn=div5#se40.22.112\\_13](http://www.ecfr.gov/cgi-bin/text-idx?SID=7b428076728848bac17bd561663b33e0&node=pt40.22.112&rgn=div5#se40.22.112_13)

Special Condition No. 7 (New) lists requirements for proper operation and maintenance of the No. 2 API Separator and Guard Basins 5 and 6.

Special Condition No. 8 specifies chronic biomonitoring requirements for Outfall 001 effluent.

Special Condition No. 9 provides for requests to reduce biomonitoring frequency after specified periods of successful testing.

Special Condition No. 10 requires testing of the Outfall 001 effluent for organic pollutants annually or if the effluent fails the biomonitoring test required in Special Condition No. 8.

Special Condition No. 11 (New) requires continued implementation and maintenance of a "Pollutant Minimization Plan" to track down and clean-up of sources of PCBs. This Special Condition also specifies details of monitoring requirements for PCBs.

Special Condition No. 12 (New) requires PCB monitoring above and beyond that required by the Delaware River Basin Commission.

Special Condition No. 13 (New) specifies details of monitoring requirements for dioxins and furans.

Special Condition No. 14 specifies sampling and reporting requirements for oil & grease compliance.

Special Condition No. 15 specifies sampling requirements for sulfides upstream of the wastewater treatment facility.

Special Condition No. 16 specifies sampling and reporting requirements for "Multiple Grabs" sample types.

Special Conditions Nos. 17, 18, and 19 require proper disposal of sludges generated in the water treatment processes, recognizing these sludges as discharges, per 40 CFR §125.3(g).

Special Condition No. 20 requires continued implementation and maintenance of a Storm Water Plan (SWP) to minimize potential contamination of storm water discharged from its facility.

Special Condition No. 21 (New) states that the operation of the permittee's wastewater treatment plant is to be under the direct supervision of a Delaware licensed/certified wastewater operator in Direct Responsible Charge (DRC), as required by State law and the Department's *Regulations for Licensing of Wastewater Operators*.

Special Condition No. 22 (New) details requirements regarding application, reporting and recordkeeping for Cooling Water Intake Structures.

## **Antidegradation Statement**

The proposed effluent limitations in the draft NPDES permit comply with the applicable portions of the *State of Delaware Surface Water Quality Standards*, Section 5.0, "Antidegradation and ERES Waters Policies".

## **Public Notice and Process for Reaching a Final Decision**

The public notice of the Department's receipt of the application and of reaching the tentative determinations outlined herein was published in the Wilmington News Journal and the Delaware State News on December 14, 2014. Interested persons submitted a public hearing request. The public hearing was public noticed on February 18, 2015, and held on March 24, 2015. Comments submitted verbally at the hearing, or in writing during the comment period were grouped by content area and responded to in a Technical Response Memorandum dated June 22, 2018.

## **Department Contact for Additional Information:**

Contact: Surface Water Discharges Section  
Telephone Number: (302) 739-9946